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Analysis of the Effect of Artificial Intelligence Integration in Design Learning on Creativity, Reflection, and Mindset

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ABSTRACT

The development of Artificial Intelligence (AI) in education, especially in design teaching, offers great potential to improve students' creativity, reflection, and design thinking mindset. This study aims to evaluate the effect of AI integration in design-based learning on students' creative thinking ability, reflection, and design mindset. The study used quantitative methods with a cross-sectional design, involving 82 respondents from various departments in higher education institutions. The research instrument was a questionnaire covering aspects of creativity, reflection, and design mindset. The data analysis technique used descriptive analysis. The results showed that 59.76% of the respondents were 19 years old, and most (85.37%) were 3rd semester students. The use of AI in design-based learning was proven to increase student creativity with an average score of 3.66 on a scale of 5, strengthen reflection skills with an average of 3.63, and improve design thinking mindset with an average of 3.75. However, the results also revealed that AI is more effective as a supporting tool in the learning process rather than replacing direct interaction between students and educators. Therefore, AI can be integrated as a tool that supports creativity, but still requires the role of human guidance.

INTRODUCTION

According to experts, artificial intelligence will continue to develop rapidly and may have a significant impact on many aspects of life, including education [1]. In the current technological development the education sector is likely to be transformed by Artificial Intelligence (AI), which will provide innovative solutions to overcome academic problems and improve learning outcomes [2]. Although Artificial Intelligence has many benefits in the field of education, it can also have a negative impact on education, especially education in Indonesia. Previous research has involved several students in 2 groups, which where the experimental group using AI while the control group without AI support for five weeks and the results The study found no significant difference in the level of design mindset between the experimental and control groups. This suggests that AI tools may improve certain skills, but do not affect the design thinking mindset of the participants[3].

Researchers have shown that maintaining a balance between the computational capabilities of AI and the intrinsic qualities of human creativity is crucial. Some mentioned that there is no significant difference in the level of design thinking mindset and the reliance on AI in creative education is a challenge [4]. If AI is used in education, it may lead to students not being encouraged to broaden their perspectives or get out of a rut. This can stifle creativity and innovation, so a balance between machine learning and human creativity is needed [5]. Educational institutions should strive to preserve the core essence of the arts by creating an environment where technology enhances rather than replaces human guidance [6]. It is crucial for AI systems to encourage children to experiment and take risks in their learning environment. This is to build a mindset that accepts challenges and resilience, which are essential characteristics for lifelong learning. It is crucial for AI systems to encourage children to experiment and take risks in their learning environment. This is to build a mindset that accepts challenges and resilience, which are essential characteristics for lifelong learning [7].

While previous research highlights the immediate benefits, there are still unanswered questions. For example, what is the long-term impact of the integration of these AI tools on students' creative education and mindset? This question will be the focus of this research and may provide new insights into creative thinking, reflective thinking, and design thinking mindset [8]. This research focuses on the use of AI in teaching design thinking with the aim of creating a more effective and engaging learning experience for students. Educators can use AI to provide innovative tools that enhance their learning process. However, this study looks at the potential limitations of using AI in teaching creative problem solving and emphasizes how important it is to find the best way to balance machine learning and human creativity so that students can develop their skills without relying too much on technology [9]. Reliance on the speed and ease offered by AI can increase anxiety levels and decrease patience among students. This has the potential to create an unhealthy learning environment

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[10].

The purpose of this study is to evaluate the current research conducted on how generative AI technologies affect the creative industries, specifically in terms of design methodologies and design thinking. To achieve this goal, this research utilizes a review of existing literature to gain an understanding of the current trends and state of affairs in the field.

METHODOLOGY

This study uses a quantitative method with a cross sectional design. The data collected can be analyzed statistically to arrive at conclusions about how the variables relate to each other [11]. Where researchers collect the data they want varies depending on the tools they use, such as observations, interviews, questionnaires, or ankets. By using a cross-sectional design, data on the use of Artificial Intelligence can be comparatively analyzed to find out how each variable affects the other [12].

The respondents in this study focused on university students, involving those from various study programs as they are considered relevant as they are in a critical phase of intellectual and emotional development and have extensive access to technology" Ref [9]". Where it consists of individuals who are currently enrolled in higher education institutions totaling 82 people. Sampling is based on availability and ease of obtaining it or called convenience sampling [13].

The sampling technique used in this research is Internet Interviews. In this modern digital era, almost everyone has access to the internet, and surveys through online media are increasingly popular, making it easier for anyone to access the questionnaire link. Sampling was carried out by distributing online questionnaires, namely Google Forms which were distributed to students via the Whatsapp platform [14].

The following table presents data regarding the demographics of the respondents, including gender and age distribution. This data provides an overview of the research population, which included students from various backgrounds.

Table 1
Instrument Grid

No	Aspect / Sub-factor	Statement	Statement Number	Reference
1	Aspects of Creative Thinking Ability	I feel the integration of artificial intelligence in design-based learning helps me generate creative ideas	1	*Effectiveness of artificial intelligence integration in design-based learning on design thinking mindset, creative and reflective thinking skills: An experimental study* [3]
		The use of artificial intelligence tools like ChatGPT or Midjourney motivates me to think outside the box	2	
		Artificial intelligence makes it easier for me to find creative solutions to problems in learning	3	
		I find it easier to think "outside the box" when using artificial intelligence in the design process	4	
2	Aspects of Reflective Thinking Ability	I often reflect back on my learning process after using artificial intelligence	5	
		The integration of artificial intelligence helps me re-evaluate what I have learned in more depth	6	
		Artificial intelligence tools allow me to consider more approaches or methods in completing tasks	7	
		I feel more capable of critically reflecting on my work after using artificial intelligence	8	
3	Aspects of Design Thinking Mindset	The use of artificial intelligence helped me better understand the design thinking approach to problem solving	9	
		I feel comfortable facing challenges or problems that don't have an immediate solution after using artificial intelligence	10	
		Artificial intelligence helps me develop empathy for the user or audience when designing solutions	11	
		I seek innovative solutions to design problems by using the principles of design thinking after utilizing artificial intelligence.	12	
4	Aspects of Artificial	Artificial intelligence improved the effectiveness of the design-based learning I participated in	13	

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	Intelligence's Influence on Learning	I feel that artificial intelligence provides useful guidance in the process of developing ideas and designs	14	
		The integration of artificial intelligence makes the learning process more interactive and engaging	15	
		I feel that the influence of artificial intelligence in the development of practical skills in the field of design is considerable	16	

Descriptive Analysis Technique

The data was assessed quantitatively using a Likert scale with the aim of providing a score in the form of a scale on each statement in the questionnaire. The Likert Scale levels used are as follows:

Table 2
Likert Scale

Scale	Ket.
5	Strongly agree
4	Agree
3	Neutral
2	Disagree
1	Strongly disagree

After the average value of the answer is known, then the results are interpreted based on table 1 then the researcher makes a cotinium line: After the average value of the answer is known, then the results are interpreted based on table 1 then the researcher makes a cotinium line:

NJI (Intervall-Level-Wert) $= \frac{Max\ Value - Min\ Value}{Number\ of\ criteria\ statements}$

Scale Width $= \frac{5-1}{5}$

$= 0{,}8$

It can be concluded that:

a. Index Minimum: 1
b. Index Maximum: 5
c. Interval: 5-1 = 4

Table 3
Interval Scale Likert

Scale	Ket.
1,00 -1,80	Strongly disagree
1,81 – 2,60	Disagree
2,61-3,40	Neutral
3,41-4,20	Agree
4,21-5,00	Strongly agree

The table above is a continuum line used to make it easier for the author to see the assessment categories regarding the variables studied.

RESULT & DISCUSSION

The following table presents the demographic data of respondents based on gender. Of the total 82 respondents, the majority were female with 58 people (70.73%), while 24 people (29.27%) were male. The average age of respondents, both male and female, was 19 years old. This shows that this study involves a population of students who are in a uniform age group, so the data can describe their understanding of the Influence of Artificial Intelligence more consistently.

Table 4
Respondent Demographics

Gender	N	Percentage (%)	Mean age (years)
Male	24	29.27%	19 years
Female	58	70.73%	19 years
Total	82		

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The table below presents the data collected through the questionnaire providing a detailed picture of the impact of AI on various aspects of students' thinking skills. Each item measured, from creative thinking, to reflective thinking, to design mindset, as well as the influence of AI in learning, was assessed based on respondents' experiences and perceptions. The following table presents a descriptive analysis that includes the mean, median, total score (sum), and minimum and maximum ranges for each aspect assessed.

Table 5
Aspect/Factor Descriptive Data

No	Item/Statement	Mean	Median	Sum	Minimum	Maksimum
1	Creative Thinking Skills	3.66	3.75	301	1.75	5.00
2	Reflective Thinking Ability	3.63	3.75	298	1.75	5.00
3	Design Thinking Mindset	3.75	3.50	299	1.75	5.00
4	The Influence of Artificial Intelligence on Learning	3.64	3.75	299	1.50	5.00

The table above provides an overview of how artificial intelligence (AI) affects various aspects of student learning. In terms of creative thinking skills, AI has helped many students improve their creativity, with a mean score of 3.66 and a median of 3.75. However, there are some students who may not have felt the maximum impact, as seen from the minimum score of 1.75. Then, on the reflective thinking aspect, the mean score of 3.63 shows that AI also helps students to reflect more on their learning process, helping them to self-evaluate. Just like the previous aspect, there were variations in the experience of students, with scores ranging from 1.75 to 5.00. For the design thinking mindset, which is important in the development of solutive and innovative ways of thinking, AI also showed a positive impact, with an average of 3.75. However, the slightly lower median (3.50) shows that students' experiences in this regard still vary. Finally, on the aspect of AI's influence on overall learning, the mean of 3.64 shows that AI has a significant impact on helping students learn more flexibly and adaptively. However, the minimum score of 1.50 suggests that some students may still face obstacles in optimizing this technology. Overall, the data in this table shows that AI has great potential to support student learning, but there is still room to improve its utilization so that all students can benefit equally.

The integration of AI in design learning is proven to expand students' creative thinking skills, especially in the process of generating ideas and alternative solutions. The results show that students who use generative AI such as ChatGPT or MidJourney can find a variety of ideas faster, but still need direction from the lecturer to maintain the originality of the work. Thus, AI serves as a facilitator of exploration, while creative control remains with the students to avoid complete dependence on technology [15]. In addition to creativity, students' reflective skills are also strengthened through AI integration. Students are trained to conduct self-evaluation based on instant input from the AI system, for example through text-based or visual feedback tools. This finding supports the study's assertion that the use of AI encourages more critical self-assessment, allowing students to identify weaknesses in their work independently [16]. However, this reflection did not automatically occur for all students, as some still showed limitations in interpreting technology feedback in depth. [17].

Furthermore, AI also impacts the formation of a more adaptive design thinking mindset. Students who engage in AI-based learning feel more confident in dealing with open-ended problems, as the technology helps them map out problems and provide diverse alternative solutions [18]. However, other research emphasizes that design mindset change is not only dependent on digital tools, but also on collaborative practices, empathy, and contextualized experiences [19]. Therefore, the integration of AI needs to be seen as a supporting element, not a substitute, in design learning to build students' solutive and reflective mindset. Therefore, the integration of AI needs to be seen as a supporting element, not a substitute, in design learning to build students' solutive and reflective mindset. Therefore, the integration of AI needs to be seen as a supporting element, not a substitute, in design learning to build students' solutive and reflective mindset [20]. The results are also in line with previous research which suggests that AI can improve certain skills in design education, although it may not be significant in changing the overall design mindset. This is also supported by previous research that emphasizes the importance of a balance between human creativity and AI technology in design education [2]. The limitations of this study are that the majority of students are in semester 3 and have not taken into account the differences between majors in detail. In addition, this study used quantitative methods with a cross-sectional design that may not fully capture long-term changes in students' skills or mindsets. Future research is expected to expand the scope of respondents, including students from various levels of education and more diverse disciplines.

CONCLUSION

This research shows that the integration of artificial intelligence (AI) in design-based learning has a positive impact on students' creativity, reflection and design thinking mindset. AI is able to facilitate the learning process by increasing effectiveness and encouraging innovative thinking. However, its impact on mindset change may be more practical and

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functional than profound. Although AI helps students to find creative solutions, human assistance is still important for an optimal and balanced learning process.

For further research, it is recommended to expand the scope of respondents from a more diverse range of majors and educational levels, as well as conduct a longitudinal study to evaluate the long-term impact of AI on students' creativity and reflective thinking. Research can also further investigate how AI can be integrated in practical learning, as well as explore the role of educators in maximizing the use of AI without compromising the quality of the hands-on learning experience.

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